

Torex GPS LNA S Parameter Simulation



■ Design reference data for XC2401/XC2406/XC2407/XC2408

These 4 charts are S parameters measured without the external components required to match to 50Ω.

Please use them as reference data when you design GPS block.

XC2401A8167R-G, XC2406A816UR-G, XC2407A816UR-G and XC2408A816UR-G have each S2P file.

The S2P files for downloading are the same data as below.

Please visit each individual product information page on Torex website for downloading.

○ XC2401A8167R-G

$V_{DD}=1.2V$, $T_a=25^{\circ}C$, $P_{IN}=-35dBm$

Frequency (Hz)	S11 (Input Return Loss)		S21 (Power Gain)		S12 (Reverse Isolation)		S22 (Output Return Loss)	
	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)
1000000000	-0.92	-79.24	11.70	98.50	-27.98	17.33	-6.90	-87.08
1025000000	-0.87	-80.88	11.67	97.09	-28.04	16.24	-6.99	-89.46
1050000000	-0.90	-82.57	11.64	94.98	-27.69	16.73	-6.87	-91.47
1075000000	-0.96	-85.01	11.58	93.01	-27.61	14.57	-6.87	-93.76
1100000000	-0.95	-86.10	11.50	91.25	-27.64	11.07	-6.94	-95.90
1125000000	-0.94	-88.83	11.51	88.99	-27.35	8.58	-6.99	-98.47
1150000000	-0.97	-91.14	11.46	87.04	-27.18	8.54	-6.94	-100.79
1175000000	-1.03	-92.40	11.38	85.29	-27.01	7.69	-7.06	-103.27
1200000000	-1.04	-93.82	11.41	83.69	-26.91	5.91	-7.01	-104.91
1225000000	-1.10	-95.83	11.28	82.06	-26.86	4.27	-6.96	-107.31
1250000000	-1.16	-98.06	11.31	79.59	-26.77	2.64	-7.10	-109.55
1275000000	-1.14	-99.78	11.25	78.15	-26.56	1.48	-7.17	-111.57
1300000000	-1.16	-101.37	11.20	76.11	-26.62	-0.02	-7.15	-113.94
1325000000	-1.22	-103.03	11.18	74.41	-26.63	-1.35	-7.15	-116.01
1350000000	-1.28	-104.92	11.11	72.61	-26.53	-2.03	-7.21	-118.25
1375000000	-1.29	-107.51	11.05	70.09	-26.40	-5.84	-7.22	-120.12
1400000000	-1.24	-108.90	11.04	68.71	-26.36	-5.47	-7.27	-121.89
1425000000	-1.35	-110.72	11.00	66.54	-26.30	-6.21	-7.26	-124.80
1450000000	-1.38	-112.38	10.98	65.00	-26.19	-8.50	-7.31	-126.19
1475000000	-1.40	-114.64	10.93	62.64	-26.12	-9.88	-7.33	-128.50
1500000000	-1.40	-116.71	10.84	60.89	-26.27	-9.94	-7.40	-130.73
1525000000	-1.43	-118.10	10.84	59.04	-26.01	-13.79	-7.37	-132.87
1550000000	-1.46	-119.55	10.82	57.47	-26.15	-15.15	-7.41	-134.81
1575000000	-1.48	-121.93	10.76	55.40	-26.00	-15.24	-7.41	-136.97
1600000000	-1.55	-123.79	10.71	53.16	-25.75	-17.19	-7.46	-139.10
1625000000	-1.53	-125.91	10.66	51.09	-25.89	-17.33	-7.52	-140.91
1650000000	-1.65	-127.44	10.59	49.45	-25.73	-19.23	-7.44	-142.83
1675000000	-1.61	-128.85	10.56	48.05	-25.57	-20.74	-7.47	-145.04
1700000000	-1.69	-131.14	10.51	45.58	-25.65	-22.02	-7.54	-146.82
1725000000	-1.68	-133.07	10.47	43.74	-25.51	-21.90	-7.49	-149.02
1750000000	-1.71	-134.06	10.42	41.87	-25.62	-24.25	-7.60	-151.25
1775000000	-1.79	-136.21	10.38	40.29	-25.57	-25.16	-7.62	-153.19
1800000000	-1.81	-137.87	10.30	38.49	-25.42	-26.23	-7.65	-154.77
1825000000	-1.80	-139.74	10.23	36.43	-25.60	-26.84	-7.63	-156.60
1850000000	-1.82	-141.91	10.22	34.71	-25.54	-28.88	-7.64	-159.25
1875000000	-1.84	-143.08	10.22	33.07	-25.51	-28.74	-7.58	-161.32
1900000000	-1.97	-145.28	10.13	30.91	-25.17	-31.13	-7.66	-162.57
1925000000	-1.87	-147.08	10.11	29.21	-25.52	-31.97	-7.81	-164.32
1950000000	-1.95	-149.36	10.06	26.98	-25.21	-32.99	-7.67	-166.87
1975000000	-1.94	-150.66	9.98	25.63	-25.35	-35.98	-7.69	-168.30
2000000000	-2.03	-152.57	9.94	23.74	-25.44	-35.92	-7.64	-170.72

*The values were tested under the condition of the board mounting (refer to P5).

These values include characteristics of SMA connector.

○ XC2406A816UR-G

 $V_{DD}=V_{CE}=2.85V$, $T_a=25^{\circ}C$, $P_{IN}=-35dBm$

Frequency (Hz)	S11 (Input Return Loss)		S21 (Power Gain)		S12 (Reverse Isolation)		S22 (Output Return Loss)	
	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)
100000000	-2.32	-92.41	20.13	-130.93	-44.76	131.48	-2.30	-81.86
102500000	-2.41	-94.74	19.99	-133.75	-43.92	129.01	-2.31	-83.82
105000000	-2.47	-96.37	19.93	-137.12	-44.34	124.47	-2.36	-86.08
107500000	-2.60	-98.95	19.77	-140.39	-42.06	126.40	-2.40	-87.97
110000000	-2.63	-100.33	19.58	-143.75	-42.40	133.08	-2.50	-90.12
112500000	-2.76	-103.17	19.46	-147.24	-40.72	123.51	-2.50	-92.56
115000000	-2.85	-105.62	19.33	-150.30	-40.92	119.98	-2.52	-94.53
117500000	-2.94	-107.10	19.17	-153.23	-41.08	125.95	-2.61	-97.11
120000000	-3.03	-109.27	19.14	-156.35	-38.82	123.19	-2.64	-98.81
122500000	-3.14	-111.39	18.87	-159.21	-38.72	120.04	-2.76	-101.13
125000000	-3.37	-113.41	18.80	-162.78	-39.48	121.71	-2.81	-103.13
127500000	-3.44	-115.39	18.57	-165.77	-37.75	115.28	-2.88	-104.75
130000000	-3.47	-117.02	18.40	-168.69	-38.06	111.18	-2.93	-106.90
132500000	-3.63	-118.66	18.29	-171.47	-37.10	113.12	-2.93	-109.39
135000000	-3.63	-121.26	18.06	-174.63	-37.44	113.09	-2.99	-111.65
137500000	-3.77	-123.26	17.92	-177.65	-36.11	107.11	-3.06	-113.56
140000000	-3.79	-125.09	17.78	-179.97	-35.83	107.49	-3.17	-115.92
142500000	-3.93	-127.22	17.70	-176.83	-35.25	111.32	-3.18	-118.45
145000000	-4.14	-129.21	17.55	-174.25	-34.70	104.85	-3.36	-120.79
147500000	-4.15	-131.38	17.38	-170.69	-34.91	108.56	-3.32	-122.27
150000000	-4.21	-133.83	17.19	-168.28	-33.83	103.73	-3.53	-125.03
152500000	-4.34	-135.29	17.12	-165.45	-33.44	99.75	-3.51	-127.00
155000000	-4.36	-137.27	17.01	-162.50	-32.81	98.28	-3.61	-129.71
157500000	-4.58	-139.70	16.85	-159.58	-32.26	96.17	-3.76	-131.69
160000000	-4.72	-142.10	16.68	-156.27	-32.26	94.72	-3.95	-133.79
162500000	-4.80	-144.00	16.55	-153.01	-31.53	91.90	-4.13	-135.63
165000000	-5.06	-145.94	16.40	-149.90	-31.00	86.67	-4.35	-138.03
167500000	-5.35	-147.89	16.20	-147.27	-30.60	84.40	-4.48	-139.49
170000000	-5.54	-148.79	15.98	-143.21	-30.19	80.66	-4.72	-140.39
172500000	-5.78	-149.95	15.73	-140.52	-30.12	77.93	-4.83	-141.51
175000000	-5.88	-150.36	15.46	-137.79	-30.31	71.79	-4.81	-142.82
177500000	-5.94	-151.67	15.22	-135.61	-29.97	71.34	-4.85	-143.77
180000000	-5.91	-152.36	14.98	-133.64	-29.91	68.96	-4.81	-145.41
182500000	-5.77	-154.55	14.83	-131.65	-29.77	69.97	-4.74	-148.14
185000000	-5.78	-156.67	14.80	-129.49	-29.72	70.51	-4.86	-150.82
187500000	-5.77	-158.47	14.76	-126.81	-29.46	68.57	-4.94	-153.66
190000000	-6.02	-161.67	14.60	-123.58	-28.34	68.19	-5.21	-155.48
192500000	-6.09	-163.87	14.46	-120.68	-28.04	65.10	-5.38	-157.72
195000000	-6.28	-165.66	14.27	-117.70	-27.75	62.85	-5.52	-158.88
197500000	-6.42	-167.37	14.09	-115.10	-27.30	59.25	-5.71	-160.54
200000000	-6.71	-168.87	13.93	-112.11	-27.00	55.66	-5.89	-162.42

*The values were tested under the condition of the board mounting (refer to P5).

These values include characteristics of SMA connector.

○ XC2407A816UR-G

 $V_{DD}=V_{CE}=2.85V$, $T_a=25^{\circ}C$, $P_{IN}=-35dBm$

Frequency (Hz)	S11 (Input Return Loss)		S21 (Power Gain)		S12 (Reverse Isolation)		S22 (Output Return Loss)	
	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)
1000000000	-1.01	-76.62	9.97	90.69	-30.39	11.22	-4.66	-87.41
1025000000	-1.04	-78.59	9.91	88.99	-29.99	8.18	-4.78	-89.38
1050000000	-1.02	-80.17	9.89	86.73	-29.99	8.14	-4.80	-91.93
1075000000	-1.06	-82.31	9.81	84.73	-29.99	6.24	-4.82	-93.90
1100000000	-1.06	-83.24	9.74	82.69	-29.83	4.06	-4.88	-95.82
1125000000	-1.12	-86.11	9.73	80.11	-29.57	3.61	-4.96	-98.73
1150000000	-1.09	-88.05	9.66	78.02	-29.67	2.36	-4.95	-100.16
1175000000	-1.17	-89.48	9.56	76.04	-29.69	-0.68	-5.05	-102.64
1200000000	-1.16	-90.73	9.61	74.40	-29.49	-3.96	-5.06	-104.88
1225000000	-1.23	-92.52	9.45	72.58	-29.49	-2.05	-5.18	-107.28
1250000000	-1.35	-95.09	9.47	69.81	-29.80	-3.68	-5.21	-108.67
1275000000	-1.30	-96.60	9.38	68.02	-29.35	-4.06	-5.28	-111.47
1300000000	-1.33	-98.06	9.34	66.01	-29.48	-4.21	-5.33	-113.14
1325000000	-1.40	-99.44	9.29	64.11	-29.14	-6.66	-5.33	-115.50
1350000000	-1.42	-101.16	9.21	62.05	-29.10	-8.27	-5.40	-117.36
1375000000	-1.47	-103.84	9.15	59.38	-29.03	-7.26	-5.38	-119.45
1400000000	-1.46	-105.27	9.09	57.91	-29.53	-8.94	-5.47	-121.64
1425000000	-1.51	-106.61	9.05	55.80	-29.14	-11.10	-5.42	-124.49
1450000000	-1.58	-108.38	9.02	54.01	-29.14	-12.39	-5.63	-126.26
1475000000	-1.57	-110.50	8.96	51.41	-29.26	-12.41	-5.61	-128.02
1500000000	-1.57	-112.70	8.86	49.53	-29.37	-15.25	-5.66	-130.43
1525000000	-1.57	-113.88	8.87	47.63	-29.45	-13.38	-5.77	-132.40
1550000000	-1.67	-115.18	8.81	45.76	-29.27	-14.03	-5.80	-134.34
1575000000	-1.66	-117.34	8.77	43.50	-29.37	-14.32	-5.86	-136.82
1600000000	-1.74	-119.26	8.70	40.92	-29.36	-15.16	-5.95	-138.39
1625000000	-1.77	-121.26	8.62	38.60	-29.31	-13.62	-6.03	-139.85
1650000000	-1.82	-122.30	8.53	36.87	-28.95	-14.26	-6.03	-142.01
1675000000	-1.78	-123.58	8.48	35.48	-28.78	-15.73	-6.01	-144.08
1700000000	-1.84	-125.79	8.38	32.61	-28.60	-15.34	-6.09	-145.70
1725000000	-1.81	-127.60	8.33	30.84	-28.31	-14.95	-6.10	-147.73
1750000000	-1.84	-128.47	8.26	29.02	-28.55	-19.23	-6.09	-149.76
1775000000	-1.84	-130.46	8.24	27.22	-28.42	-19.21	-6.17	-152.06
1800000000	-1.93	-132.24	8.14	25.39	-28.21	-18.67	-6.19	-154.00
1825000000	-1.87	-134.25	8.06	23.16	-28.62	-17.77	-6.28	-156.46
1850000000	-1.95	-136.42	8.04	21.13	-28.20	-18.71	-6.28	-158.42
1875000000	-1.93	-137.15	8.00	19.29	-28.44	-17.51	-6.32	-160.11
1900000000	-2.02	-138.95	7.91	16.91	-28.12	-18.80	-6.39	-161.54
1925000000	-1.96	-140.53	7.86	15.10	-27.97	-17.41	-6.51	-163.55
1950000000	-1.94	-142.85	7.79	12.91	-27.55	-19.67	-6.49	-165.42
1975000000	-1.96	-144.08	7.67	11.44	-27.37	-19.51	-6.40	-166.74
2000000000	-1.98	-145.39	7.62	9.48	-27.10	-21.24	-6.43	-169.49

*The values were tested under the condition of the board mounting (refer to P5).

These values include characteristics of SMA connector.

○ XC2408A816UR-G

 $V_{DD}=V_{CE}=2.85V$, $T_a=25^{\circ}C$, $P_{IN}=-35dBm$

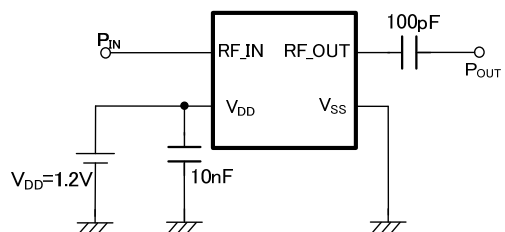
Frequency (Hz)	S11(Input Return Loss)		S21(Power Gain)		S12(Reverse Isolation)		S22(Output Return Loss)	
	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)	Log Mag (dB)	Phase (°)
1000000000	-1.42	-103.17	26.09	-126.07	-39.33	117.40	-3.57	-112.40
1025000000	-1.53	-105.88	26.01	-129.35	-38.21	122.02	-3.74	-114.93
1050000000	-1.70	-108.36	25.92	-133.32	-37.65	110.97	-3.80	-117.84
1075000000	-1.83	-111.86	25.78	-137.14	-37.77	114.56	-3.93	-120.22
1100000000	-1.91	-113.60	25.58	-140.72	-36.90	112.92	-4.07	-122.78
1125000000	-2.04	-116.65	25.46	-144.61	-36.27	109.06	-4.17	-126.59
1150000000	-2.20	-119.81	25.31	-148.32	-35.93	107.37	-4.26	-128.92
1175000000	-2.30	-122.02	25.16	-151.74	-35.63	102.31	-4.46	-132.42
1200000000	-2.39	-124.82	25.09	-155.40	-34.96	105.39	-4.58	-134.72
1225000000	-2.57	-127.05	24.81	-158.23	-34.25	101.07	-4.71	-137.80
1250000000	-2.83	-129.26	24.71	-162.24	-33.96	101.13	-4.81	-140.45
1275000000	-2.82	-131.73	24.55	-165.27	-34.04	97.41	-4.98	-143.67
1300000000	-2.90	-134.33	24.39	-168.63	-33.23	94.42	-5.16	-146.86
1325000000	-3.08	-136.21	24.25	-171.96	-33.12	95.00	-5.21	-149.81
1350000000	-3.10	-139.34	24.04	-175.13	-32.71	93.42	-5.42	-153.36
1375000000	-3.40	-142.10	23.87	-178.90	-31.96	88.43	-5.60	-155.98
1400000000	-3.49	-144.67	23.76	-178.10	-31.62	85.35	-5.91	-159.54
1425000000	-3.79	-147.34	23.61	-174.28	-30.73	84.63	-6.15	-163.07
1450000000	-4.02	-149.73	23.42	-171.05	-31.15	80.20	-6.43	-165.29
1475000000	-4.05	-152.11	23.20	-167.73	-30.28	79.49	-6.49	-168.41
1500000000	-4.27	-155.27	23.03	-164.55	-30.19	75.94	-6.90	-171.71
1525000000	-4.50	-158.38	22.90	-160.98	-29.70	73.72	-7.03	-175.37
1550000000	-4.60	-159.92	22.73	-157.86	-29.10	72.87	-7.40	-177.74
1575000000	-4.92	-162.40	22.50	-154.40	-29.20	69.62	-7.69	-178.86
1600000000	-5.21	-165.64	22.28	-151.00	-28.82	65.75	-8.16	-175.89
1625000000	-5.50	-167.70	22.03	-147.40	-28.40	63.17	-8.51	-173.29
1650000000	-5.79	-169.17	21.81	-144.59	-28.19	61.27	-8.85	-171.66
1675000000	-6.14	-172.83	21.66	-141.48	-27.67	57.14	-9.27	-168.45
1700000000	-6.48	-174.67	21.38	-137.42	-27.43	53.47	-9.96	-164.03
1725000000	-7.05	-176.62	21.07	-133.86	-26.83	50.28	-10.65	-163.57
1750000000	-7.50	-178.03	20.74	-130.72	-27.04	45.18	-11.30	-164.60
1775000000	-7.88	-177.89	20.35	-127.97	-27.07	42.20	-11.96	-166.10
1800000000	-8.04	-176.22	20.00	-126.18	-27.02	39.16	-11.91	-168.23
1825000000	-7.91	-176.57	19.78	-124.51	-27.31	38.00	-11.64	-167.19
1850000000	-8.08	-178.05	19.66	-121.88	-27.16	37.91	-11.52	-164.66
1875000000	-8.30	-180.00	19.48	-118.94	-26.71	36.89	-12.24	-160.45
1900000000	-8.67	-179.51	19.17	-115.95	-26.28	32.99	-12.71	-160.39
1925000000	-8.92	-179.96	18.86	-113.41	-26.47	29.85	-13.14	-161.24
1950000000	-9.18	-179.39	18.58	-111.10	-26.51	25.86	-13.39	-163.80
1975000000	-9.18	-179.58	18.32	-109.40	-26.31	24.26	-13.19	-162.70
2000000000	-9.32	-178.84	18.12	-107.29	-26.27	23.13	-13.05	-162.15

*The values were tested under the condition of the board mounting (refer to P5).

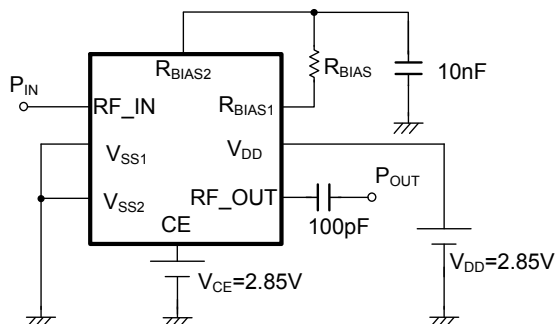
These values include characteristics of SMA connector.

○ TEST CONDITIONS

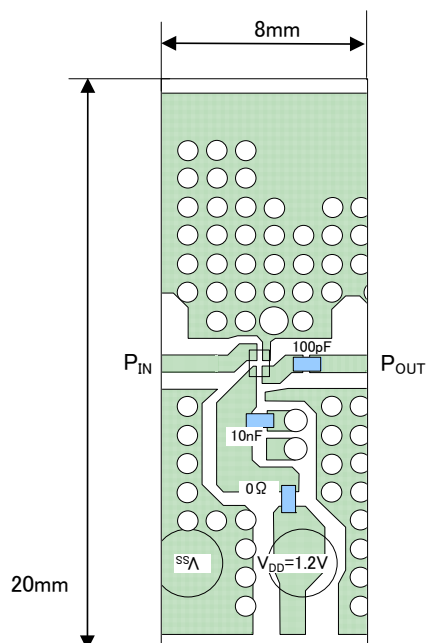
○ XC2401 TEST CIRCUIT



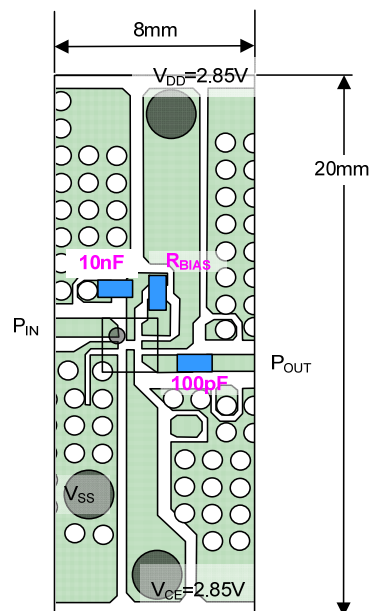
○ XC2406/XC2407/XC2408 TEST CIRCUIT



○ XC2401 TEST BOARD



○ XC2406/XC2407/XC2408 TEST BOARD



○ Parts List

	PART NUMBER	MAKER
100pF	GRM1552C1H101	MURATA
10nF	GRM155B11E103	MURATA

R_{BIAS} Resistance Values

PART NUMBER	R _{BIAS} Resistance Value
XC2406A816UR-G	270 Ω
XC2407A816UR-G	430 Ω
XC2408A816UR-G	240 Ω